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ABSTRACT

This report summarizes information, including selected indices of nutritional status, as reported from 28 states and the District of Columbia to the Nutritional Status Surveillance System. This system has two components, one addressing nutritional status among high-risk pediatric populations, and the other addressing nutritional status among pregnant women from generally low-income, high-risk groups. Data came from a variety of sources including health department clinics and other health and nutrition programs. Statistics are presented on both pediatric surveillance results and pregnancy nutrition surveillance. The history of the surveillance system is traced and its methods and procedures are explained. A description is provided of the surveillance population, survey quality control, and interpretation of trends. (JD)

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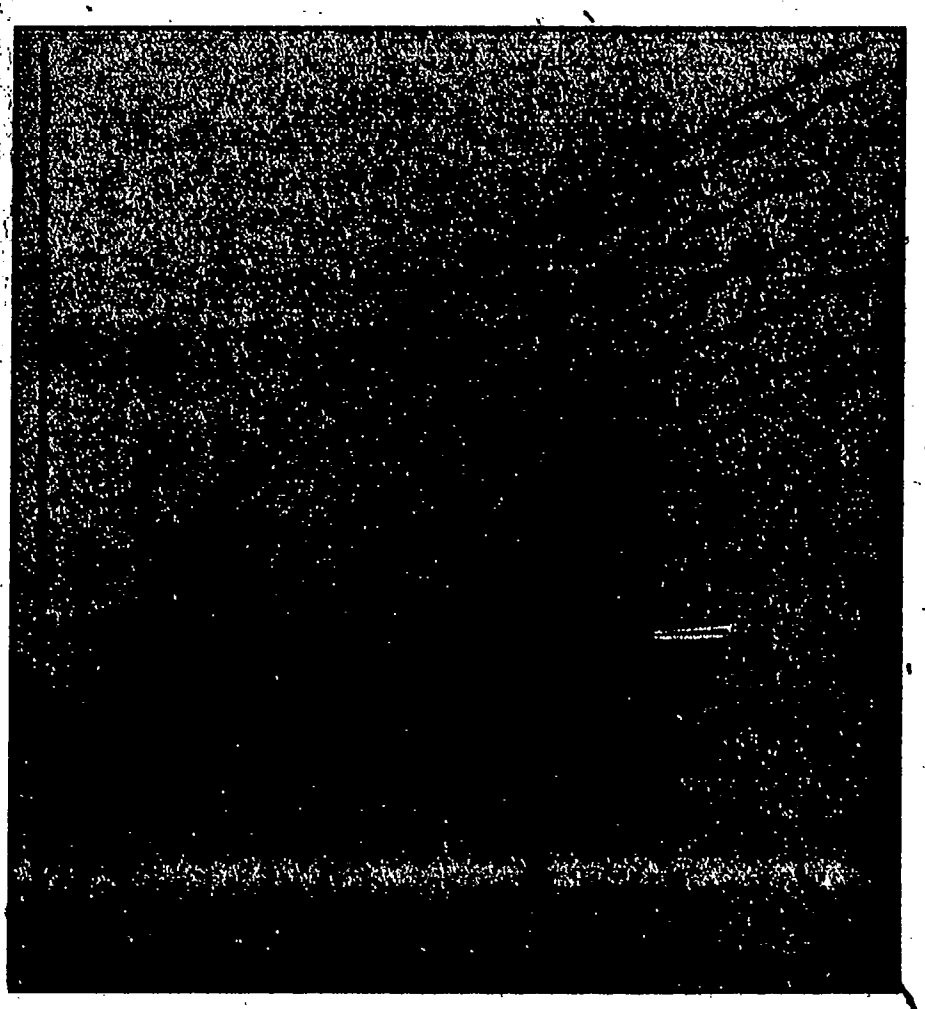
ISSUED AUGUST 1984

CENTERS FOR DISEASE CONTROL

NUTRITION SURVEILLANCE



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PREFACE

This report summarizes information including selected indices of nutritional status reported from 28 States and the District of Columbia to the Nutritional Status Surveillance System coordinated by the Centers for Disease Control. This system has two components, one addressing nutritional status among high-risk pediatric populations and the other addressing nutritional status among pregnant women from generally low-income, high-risk groups. The development of this system is an ongoing process that seeks to expand the data base by increasing the number of participating States and by adding a broader range of nutritional status indices as their utility and availability become evident. As much as possible, tabulations in subsequent issues will be presented in the same format to facilitate the comparison of data from year to year.

The data we present come from a variety of sources including health department clinics and other health and nutrition programs. Because of the lack of uniformity of data sources and methodology, direct comparisons among States should be made with caution.

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SUMMARY OF FINDINGS

In 1982, data from approximately 452,000 children from birth through 9 years of age from 28 States and the District of Columbia were submitted to the Pediatric Nutrition Surveillance System coordinated by the Centers for Disease Control (CDC). Approximately 75% of the children were screened as part of the Special Supplemental Food Program for Women, Infants, and Children (WIC), and approximately 17% were examined in the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program. The majority of children screened were white (53%), followed by blacks (33.17%) and Hispanics (10.6%). Ninety-three percent of the children in the surveillance system were preschoolers under 6 years of age. The data tabulated represent the results of initial screening examinations at the time a child entered a health or nutrition program included in the surveillance system.

Nutrition-related abnormalities were identified in 21% to 37% of screened children of different race and ethnic origins. Multiple abnormal indices potentially related to nutrition were observed in approximately 2% to 7% of the children. The highest prevalence of abnormalities was found among Asian children because of the inclusion of Southeast Asian refugees.

The most prevalent nutrition-related problems defined by anthropometry were short stature (height-for-age below the 5th percentile) and overweight (weight-for-height above the 95th percentile). For most ethnic groups the prevalence of short stature was highest in infants and children under 2 years of age, but among Hispanics the prevalence of low height-for-age remained relatively high in children over 2 years of age as well. Trends toward a modest decrease in the prevalence of short stature among white, black, Hispanic, and Native American children were noted over the period 1977-81. The decline in prevalence occurred principally among children less than 2 years of age.

The prevalence of overweight also tended to be greatest among infants and children under 2 years of age. Beyond infancy, the prevalence of overweight tended to be relatively high among Hispanic and Native American children. A trend toward a modest decrease in the prevalence of overweight among white, black, Hispanic, and Native American children was noted over the period 1978-82 among children less than 2 years of age.

The prevalence of low weight-for-height (below the 5th percentile) was consistently at or below the 5% level for all age and ethnic groups except 12- to 23-month-old Asian children. These data suggest that thinness, as a reflection of undernutrition, is not a major public health problem among children reported to CDC's Pediatric Nutrition Surveillance System.

Overall downward trends in the prevalence of low hemoglobin and hematocrit values were apparent among black and white children from 1977-81. Among Hispanic and Native American children the downward trend in prevalence was less consistent. Estimates of the actual prevalence of anemia vary widely depending on the criteria used to define "low" values.

During 1982, almost 20,000 records from 15 States were submitted to the Pregnancy Nutrition Surveillance System. These data came from maternal and

child health, WIC, and other health programs providing prenatal care. Results indicated that smoking cigarettes during pregnancy was more common among white women (41.4%) than among black women (26.3%). Very few women had high blood pressure. Low hematocrit levels were evident in 24.3% of the women while 13.8% had low hemoglobin levels. Black women had by far the highest prevalence of anemia with 35.4% having low hematocrit levels and 23.1% having low hemoglobin levels. Overall, 37.8% of women were breast feeding at the first postnatal visit. Mothers 20 years of age and older were more likely to breast feed than younger mothers and breast feeding was more prevalent among white (47.7%) and Native American mothers (52.4%) than among Hispanic (28.5%) and black (23.0%) mothers. Only 12.1% of black teenage mothers were breast feeding at 6-10 weeks. Unfortunately, breast-feeding data are available on only 35% of women in the surveillance system so these data may not be representative of breast-feeding patterns.

Overall, low birth weight (less than 2,500 grams) was observed in 7.1% of infants born to women in the pregnancy surveillance system. Low birth weight was more common among women less than 20 years of age and among black women regardless of age. Mothers who smoked were almost twice as likely to deliver a low-birth-weight infant as compared with nonsmoking mothers.

CRITERIA FOR ABNORMAL VALUES

The following criteria and reference populations are used in defining indicators and assessing the prevalence of abnormal values.

1. Low Hemoglobin and Low Hematocrit: In monthly and quarterly surveillance reports provided to States by CDC, low hemoglobin and hematocrit are defined as values below the 5th percentile for age. The reference curves defining the 5th percentile values were developed by CDC using data from HANES I (see Nutrition Surveillance, Annual Summary 1980). In the Annual Summaries, tabulations of the prevalence of low hemoglobin and hematocrit values are also presented using the cut off values specified in the following table:

Age	Hemoglobin	Hematocrit
6-23 months	10 grams	31%
2-5 years	11 grams	34%
6-14 years	12 grams	37%
15 or more years (females)	12 grams	37%
15 or more years (males)	13 grams	40%
Pregnancy: 1st trimester	12 grams	37%
2nd trimester	11 grams	34%
3rd trimester	10.5 grams	33%

2. Low Height-for-Age: Height-for-age less than the 5th percentile for children of the same sex and age in the reference population. This indicator describes short stature for age. In the present report the term "height" refers to measurements of length in recumbent children through 24 months of age and upright stature in children over 24 months of age.

3. Low Weight-for-Height: Weight-for-height less than the 5th percentile for children of the same sex and height in the reference population. This indicator describes thinness.

4. High Weight-for-Height: Weight-for-height greater than the 95th percentile for children of the same sex and height in the reference population. This indicator describes overweight or obesity.

Reference Population for Height and Weight: The NCHS-CDC reference population (1) consists of a smoothed distribution of percentiles for the following populations:

Age	Reference Population Data Sources
Birth - 24 months	Fels Research Institute Growth Study
25 - 59 months	First Health and Nutrition Examination Survey (HANES I)
60 - 143 months	National Health Examination Survey, Cycle II, and HANES I
144 - 215 months	National Health Examination Survey, Cycle III, and HANES I

Note: Growth percentiles represent heights and weights that have been standardized for sex and age and sex and height in the case of weight-for-height.

Therefore, percentiles may be used to make height and weight comparisons between groups of individuals. However, comparisons of height and weight among groups including persons of diverse ethnic origins should be made with care because of possible genetic differences in growth potential.

Reference Population for Hemoglobin and Hematocrit: The reference population used for evaluation of hemoglobin and hematocrit data was derived from HANES I data for the age group 6 months to [illegible] of age. A brief review of the development of this reference population is presented in the CDC Nutrition Surveillance Annual Summary for 1980 (2).

SYMBOLS USED IN TABLES

The following symbols are used in tables to explain missing or zero quantity data:

Category Not Applicable	....
Quantity Zero	-
Quantity More Than Zero but Less Than 0.05	0.0
Value Does Not Meet Standards of Reliability or Precision	*

PEDIATRIC NUTRITION SURVEILLANCE SYSTEM

History

In 1973, the CDC began working with five States (Arizona, Kentucky, Louisiana, Tennessee, and Washington) to develop a system for continuously monitoring the nutritional status of specific, high-risk population groups. These five States recognized the need for timely nutrition-related data on such populations for use in program planning and evaluation. The system is based upon utilization of readily available data from selected health service delivery programs. Once this nucleus of States demonstrated that the surveillance mechanism was practical and workable, a gradual expansion into other States occurred.

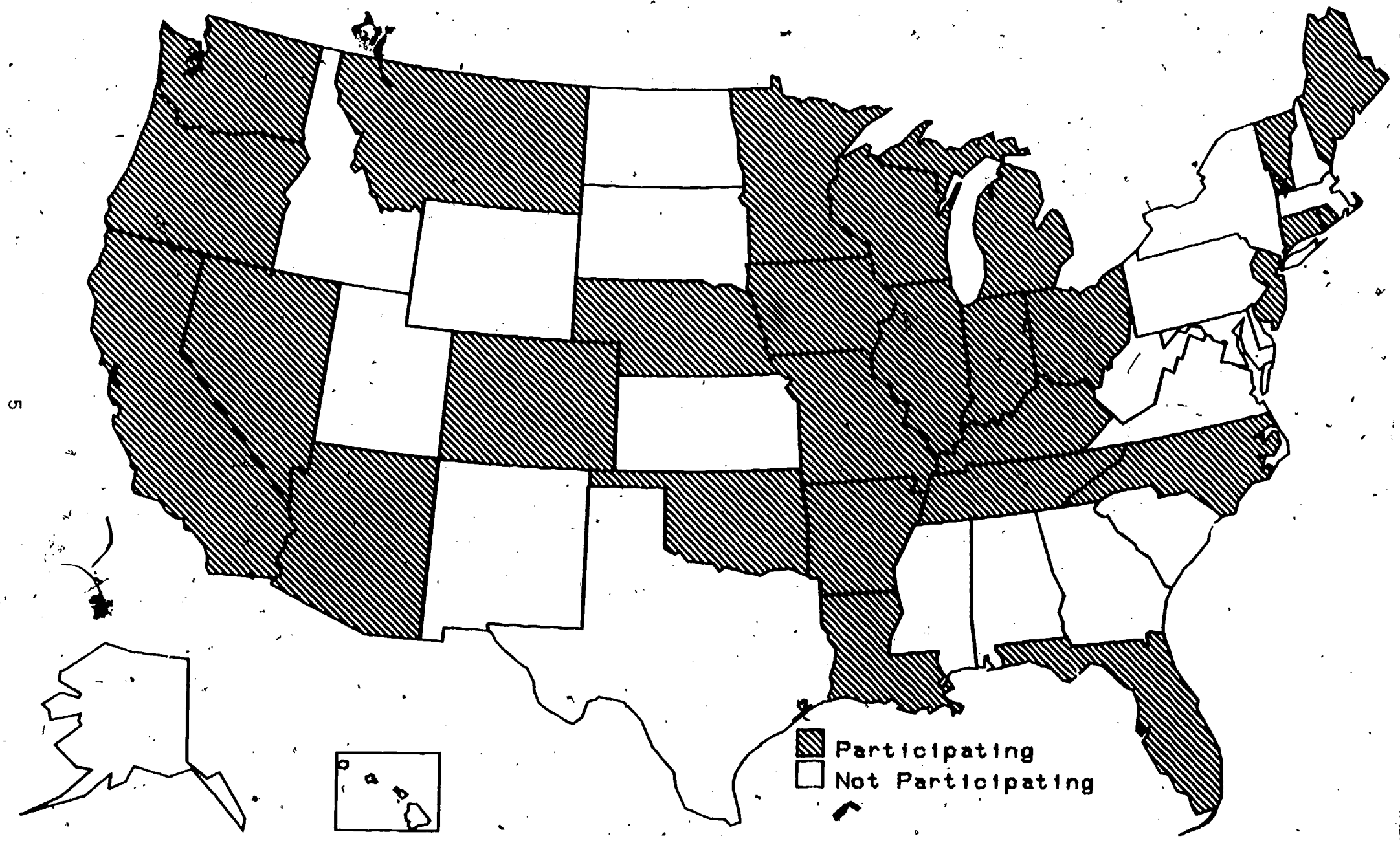
During 1982, the CDC worked with 28 States and the District of Columbia in an expanding nutritional status surveillance program aimed primarily at selected high-risk pediatric populations (Figure 1).

Methods and Procedures

Nutritional status indicators used in surveillance were selected from those indicators that are applied in nutritional status surveys. These indicators relate to the most widely prevalent nutritional problems and are based on measurements that are inexpensively and routinely obtained by local clinic staff.

The principal sources of nutrition surveillance data have been maternal and child health (MCH) programs and programs such as EPSDT, WIC, and Head Start, which have been implemented to improve the health and well-being of high-risk children, particularly minority preschoolers, disadvantaged schoolchildren,

Figure 1. State participation in pediatric nutrition surveillance — 1982
CDC Pediatric Nutriion Surveillance System



and pregnant adolescents. Program administrators require up-to-date information on the prevalence and distribution of nutrition-related problems for effective program management. Nearly all health-oriented programs for children require that they be weighed and measured and a hemoglobin or hematocrit done. These simple and inexpensive determinations are relevant to assessment of the three most common nutrition-related problems in the United States (as documented by the major U.S. nutrition surveys): retardation of linear growth, overweight, and anemia.

Data on other important characteristics, such as age, sex, and ethnic background, are also readily available and can be incorporated into the surveillance mechanism with minimal additional cost and effort. Additional items can be added to nutrition surveillance provided they meet the following criteria: (1) Such items must be indicative of or related to poor nutritional status or predictive of changes in nutritional status, and (2) the data items must be amenable to quality control.

The Pediatric Nutrition Surveillance System depends on the timely flow of data between the local level and the central data-processing point. Clinic personnel at the local level record identifying and administrative information and the height, weight, hemoglobin or hematocrit, or other pertinent variables for each child screened in a service delivery program. These data are sent to the State health department where they are edited for obvious measurement errors or inconsistent recording of data and keyed onto computer tapes. These tapes are either processed within the State or sent to CDC where the data are analyzed.

The basic analyses are conceptually simple. Each child's height, weight, and hemoglobin or hematocrit values are compared with reference population values. These comparisons form the basis of prevalence estimates for anemia, growth retardation, and overweight. The data are then sent back to the States for use at the State, district, and local levels.

Monthly printouts that list all children who were screened and found to have one or more potentially abnormal values are provided to each clinic. On a quarterly basis, tables are produced for each reporting clinic. These tables give the number of children screened; distribution by age, ethnic group, and type of program; percentage and duration of breast feeding; and prevalence of abnormal conditions as well as an estimate of the amount of measurement error. In addition, each State nutrition director receives tables that rank reporting clinics by prevalence of abnormalities including short stature, overweight, thinness, and anemia. Clinics are ranked by the percentage of probable errors in the reported data. Similar tabulations are provided annually. Tabulations can be produced as needed, showing the proportions of children found to have highly prevalent nutritional abnormalities by type of program; e.g., EPSDT, WIC, MCH clinics, etc.

Surveillance Population

During 1982, data were submitted to the Pediatric Nutrition Surveillance System for approximately 452,000 children from birth through 9 years of age

who were seen in initial screening visits in various service delivery programs. More than 700,000 additional records were submitted representing subsequent or follow-up visits by children previously screened. These data have not been routinely analyzed since the focus of the surveillance system has been on assessing the status of children at the time of their initial screenings. This focus on initial screening visits assumes that these data will best reflect the nutritional status of children who have not received the benefits of service delivery programs.

Table 1 shows the percentage distribution of screened children by State and type of service delivery program. According to the data submitted, 74.8% of the children were initially seen and certified to receive benefits in the WIC program, while 17.2% were initially seen in the EPSDT program. The remainder of the data relate to children receiving routine MCH, Head Start, general medical, or school entrance examinations. Although over 90% of the children seen in these clinics were participants in one of two large federally supported programs, a large percentage were also receiving a number of other public health services such as immunizations, lead screening, and health education from State and local health department facilities.

The ethnic-group distribution of screened children is given by State in Table 2. The majority of children screened were white (53.0%), followed by blacks (33.1%) and Hispanics (10.6%). The ethnic-group distribution of participants varied widely between programs (Table 3), but these differences reflect the overall population patterns in States participating in the surveillance system and may not be related to any inherent program differences. Over 90% of children in the surveillance system are under 6 years of age (Table 4).

The analyses in this surveillance report concentrate on 24 States whose reports permit calculation of child's age according to the date of the initial screening visit (date on which the child's measurements were obtained). Four States (Illinois, Maine, New Jersey, and Oklahoma) and the District of Columbia reported their information on the basis of date of certification rather than date of visit. This difference can be important since certification may be delayed several weeks or even months after the initial screening visit. Especially in regard to infants, an error in age determination caused by using the date of certification could lead to an overestimation of the prevalence of anthropometric abnormalities. Therefore, only States reporting date of visit are included on the tables labeled "selected States." Minor differences between this report and previous reports in regard to prevalence figures may occur because of this change.

Quality Control

Over 1.2 million records for both screening and followup visits were submitted to the Pediatric Nutrition Surveillance System in 1982. Of these, 7.6% contained errors that caused the records to be rejected by the system. The most common causes of rejection included invalid clinic or county codes, and records with clinical data omitted. The errors were caused primarily by the delay in receiving the appropriate codes of new reporting clinics and/or unresolved problems of duplicate record selection in State automated WIC voucher systems.

Table 1. Percentage distribution of screened children through 9 years of age by participating State and program — 1982
CDC Pediatric Nutrition Surveillance System

State	Program							Total	
	EPSDT[1]	Medical Attention	MCH[2]	Head Start	School Entrance Exam	WIC[3]	Combination & Other	No.	%
Arizona	0.0	–	10.6	2.7	0.0	45.8	40.8	20,158	100.0
Arkansas	1.8	–	1.4	–	–	92.6	4.1	979	100.0
California	67.8	–	–	0.5	11.8	0.1	19.8	2,096	100.0
Colorado	–	–	–	–	–	99.8	0.2	13,597	100.0
Connecticut	–	–	–	–	0.0	74.8	25.1	2,658	100.0
D.C.	–	–	–	–	–	100.0	–	8,930	100.0
Florida	0.1	–	0.1	–	0.2	97.7	1.8	60,014	100.0
Illinois	–	–	–	–	–	100.0	–	57,350	100.0
Indiana	–	–	–	–	–	100.0	–	34,565	100.0
Iowa	–	–	–	–	–	100.0	–	18,167	100.0
Kentucky	–	–	1.1	–	0.0	98.9	0.0	28,992	100.0
Louisiana	100.0	–	–	–	–	–	–	9,857	100.0
Maine	–	–	–	–	–	100.0	–	7,039	100.0
Michigan	80.6	1.7	7.1	0.0	0.0	6.0	4.5	70,799	100.0
Minnesota	–	–	–	–	–	–	100.0	2,915	100.0
Missouri	*	*	*	*	*	*	*	36	100.0
Montana	–	–	–	–	–	100.0	–	4,555	100.0
Nebraska	–	–	–	–	–	100.0	–	7,477	100.0
Nevada	–	–	–	–	–	100.0	–	7,783	100.0
New Jersey	–	–	–	–	–	100.0	–	27,523	100.0
North Carolina	8.5	1.6	23.2	–	–	59.8	6.9	21,003	100.0
Ohio	85.3	8.5	–	–	–	6.2	–	7,219	100.0
Oklahoma	–	–	–	–	–	100.0	–	5,185	100.0
Oregon	–	–	–	–	–	100.0	–	11,636	100.0
Rhode Island	–	–	0.4	–	–	98.9	0.7	277	100.0
Tennessee	8.9	0.0	2.1	0.0	0.0	82.2	6.8	15,205	100.0
Vermont	–	–	–	–	–	100.0	–	4,867	100.0
Washington	9.1	–	76.2	3.5	–	11.2	0.1	1,554	100.0
Wisconsin	*	*	*	*	*	*	*	82	100.0
TOTAL	17.2	0.5	3.1	0.1	0.1	74.8	4.2	452,518	100.0

[1]EPSDT = Early and Periodic Screening, Diagnosis, and Treatment program
[2]MCH = Maternal and child health programs
[3]WIC = Special Supplemental Food Program for Women, Infants, and Children

Note: See table of contents for explanation of symbols used in tables.

Table 2. Percentage distribution of screened children through 9 years of age by reporting State and ethnic origin — 1982
CDC Pediatric Nutrition Surveillance System

State	Ethnic Origin						Total	
	White	Black	Hispanic	Native American[1]	Asian[2]	Other & Unknown	No.	%
Arizona	37.3	5.8	45.0	11.3	0.4	0.3	20,158	100.0
Arkansas	92.6	6.9	0.1	–	0.3	–	979	100.0
California	96.3	0.4	1.7	1.0	0.5	0.1	2,096	100.0
Colorado	57.7	4.5	33.8	0.7	3.3	0.0	13,597	100.0
Connecticut	49.5	20.9	27.5	0.4	1.7	–	2,658	100.0
D.C.	1.4	92.5	5.5	0.1	0.4	–	8,930	100.0
Florida	36.4	49.5	13.0	0.2	0.7	0.2	60,014	100.0
Illinois	36.3	43.3	16.5	0.2	2.3	1.4	57,350	100.0
Indiana	66.8	27.6	4.8	0.0	0.7	–	34,565	100.0
Iowa	88.6	5.9	2.3	0.5	2.7	–	18,167	100.0
Kentucky	87.3	11.4	0.2	0.0	0.4	0.6	28,992	100.0
Louisiana	23.4	75.2	–	–	–	1.5	9,857	100.0
Maine	91.0	0.6	0.1	0.2	0.7	7.4	7,039	100.0
Michigan	48.4	44.9	2.2	0.5	0.2	3.8	70,799	100.0
Minnesota	90.7	0.6	0.7	0.3	6.3	1.4	2,915	100.0
Missouri	*	*	*	*	*	*	36	100.0
Montana	84.3	0.8	3.4	9.7	1.5	0.3	4,555	100.0
Nebraska	75.8	12.4	7.3	1.9	2.5	0.1	7,477	100.0
Nevada	59.4	22.8	14.9	1.0	1.9	–	7,783	100.0
New Jersey	25.9	43.3	29.2	0.2	1.3	0.0	27,523	100.0
North Carolina	37.0	59.3	0.7	2.3	0.6	0.1	21,003	100.0
Ohio	88.4	8.7	2.2	0.0	0.6	–	7,219	100.0
Oklahoma	67.8	18.2	7.0	4.9	2.0	–	5,185	100.0
Oregon	78.6	2.8	11.1	3.1	4.4	–	11,636	100.0
Rhode Island	66.4	24.2	7.9	–	1.4	–	277	100.0
Tennessee	85.4	13.9	0.0	0.0	–	0.6	15,205	100.0
Vermont	98.4	0.5	0.0	0.1	0.2	0.8	4,867	100.0
Washington	82.6	2.1	3.2	8.6	2.2	1.4	1,554	100.0
Wisconsin	*	*	*	*	*	*	82	100.0
TOTAL	53.0	33.1	10.6	1.1	1.1	1.1	452,518	100.0

[1]American Indian or Alaskan Native
[2]Includes Southeast Asian refugees

Table 3. Percentage distribution of screened children through 9 years of age by program and ethnic origin – 1982 CDC Pediatric Nutrition Surveillance System

Program[1]	Ethnic Origin						Total	
	White	Black	Hispanic	Native American[2]	Asian[3]	Other & Unknown	No.	%
EPSDT	55.4	40.0	1.0	0.4	0.1	1.1	77,893	100.0
Medical Attention	43.7	48.6	4.5	0.1	0.9	2.2	2,135	100.0
MCH	37.7	46.3	12.6	1.2	0.6	1.5	13,954	100.0
Head Start	48.5	9.8	30.2	9.8	0.9	0.8	655	100.0
School Entrance Exam	82.5	9.1	6.1	–	0.5	1.8	395	100.0
WIC	53.4	31.5	12.0	1.1	1.4	0.5	338,387	100.0
Combination	33.5	28.5	32.1	3.5	0.8	1.6	10,602	100.0
Other	67.2	12.4	13.1	2.9	2.5	2.0	8,405	100.0
Unknown	*	*	*	*	*	*	92	100.0
TOTAL	53.0	33.1	10.6	1.1	1.1	1.1	452,518	100.0

[1]See Table 1 for explanation of acronyms.
[2]American Indian or Alaskan Native
[3]Includes Southeast Asian refugees

Table 4. Percentage distribution of screened children through 9 years of age by program and age group in selected States – 1982[1]
CDC Pediatric Nutrition Surveillance System

Program[2]	Age						Total	
	< 3 Months	3–5 Months	6–11 Months	1 Year	2–5 Years	6–9 Years	No.	%
EPSDT	4.2	4.7	7.9	12.5	43.5	27.2	77,893	100.0
Medical Attention	13.8	6.3	8.7	12.5	38.1	20.6	2,135	100.0
MCH	16.8	6.5	11.5	10.7	40.0	14.5	13,954	100.0
Head Start	0.5	–	0.2	0.5	98.5	0.5	655	100.0
School Entrance Exam	1.5	0.8	0.8	0.8	59.0	37.2	395	100.0
WIC	39.9	7.8	12.5	14.7	25.1	–	232,360	100.0
Combination	54.5	10.9	10.7	9.6	14.2	–	10,602	100.0
Other	9.5	3.5	6.0	8.2	66.4	6.5	8,405	100.0
Unknown	*	*	*	*	*	*	92	100.0
TOTAL	30.4	7.0	11.2	13.7	30.7	7.0	346,491	100.0

[1] In this and subsquent tables the District of Columbia, Illinois, Maine, New Jersey and Oklahoma have been excluded because date of certification was provided instead of date of examination, leading to errors in age determination.
[2] See table 1 for explanation of acronyms.

The quality of recumbent-length, standing-height, and weight measurements varied from clinic to clinic. An earlier study determined that the principal causes of measurement inaccuracies are inadequate equipment, improper techniques, and insufficient personal motivation (3). Although the accuracy of measurements is often less than desirable, many health programs are improving the quality of measuring equipment as well as how that equipment is used.

Computer-editing procedures have been developed that identify those measurements most likely to be in error. These procedures are based on the statistical probability of the measurement occurring in the normal reference population. Measurements whose probability of occurrence is less than 0.1% are called highly probable errors, and those whose probability of occurrence is between 1% and 0.1% are called probable errors. Measurements labeled as probable or highly probable errors are identified in the clinic edit listings for verification or correction. To avoid including values that are highly likely to be in error, measurements whose probability of occurrence is less than 0.1% are excluded from tabulation and analysis. A more detailed review of the editing procedures is presented as an appendix to this report.

Table 5 summarizes the prevalence of highly probable errors ($p < 0.001$) by State for screened children through 9 years of age. It shows that the percentage of records without highly probable errors ranged from 93.7% to 98.7% in those States with adequate numbers for meaningful results.

Height and weight errors were the most common, accounting for 1.7% and 1.4%, respectively, and age errors accounting for 1.1%. Exclusions because of hematology errors were less common.

More than 336,000 records of screened children from birth through 9 years of age were accepted for tabulation and analysis; 4.3% of these records were found to have probable errors ($p < 0.01$) (Table 6). Those States with sufficient numbers for analysis had between 94.1% and 97.6% of their records with all values within an acceptable range. This table also shows that the most common errors related to anthropometric measures were undermeasuring height and overmeasuring weight, and the most common errors related to hematology were low readings for both hemoglobin and hematocrit.

The CDC continues to consult with States participating in the Nutritional Status Surveillance System to help improve data quality by identifying potential sources of data errors and by providing consultation in weighing and measuring techniques to State-level consultants.

Interpretation of Trends and Other Data

The data provided to State health departments by the CDC surveillance system are useful for identifying nutrition-related problems in high-risk populations and for monitoring trends. However, the data have limitations that must be taken into account. One limiting factor already discussed is the lack of strict standardization of measurement procedures in the many different health facilities where data are collected. Another limitation is the representativeness of the data. Surveillance data reported to CDC come largely from

Table 5. Prevalence of highly probable measurement, recording, and/or keying errors in records for screened children through 9 years of age in selected States – 1982
CDC Pediatric Nutrition Surveillance System

State	Number Reported	Percent With Highly Probable Error[1]					Percent Without Highly Probable Error
		Ht	Wt	Age	Hgb	Hct	
Arizona	19,840	1.9	1.2	1.0	0.5	0.3	96.8
Arkansas	977	0.8	0.8	0.9	2.4	2.8	96.9
California	2,096	2.8	1.6	1.2	...	1.0	95.1
Colorado	13,565	1.9	1.2	1.5	24.1	1.2	96.2
Connecticut	2,658	2.4	2.2	1.9	0.5	0.6	95.8
Florida	52,449	2.5	1.9	1.9	0.9	1.3	95.1
Indiana	33,804	1.7	1.3	1.2	0.3	2.0	96.4
Iowa	18,167	1.0	0.8	0.6	1.4	0.6	97.8
Kentucky	28,721	2.0	1.3	1.1	1.0	0.7	96.4
Louisiana	9,855	1.4	1.4	1.1	0.8	0.5	96.4
Michigan	70,756	0.8	1.1	0.5	0.3	0.4	97.6
Minnesota	2,915	0.3	0.7	0.5	0.7	0.5	98.7
Missouri	36	*	*	*	*	*	*
Montana	4,532	0.8	0.6	0.7	*	0.3	98.1
Nebraska	7,417	3.3	3.4	2.3	37.5	0.7	93.7
Nevada	7,746	1.7	1.0	1.1	0.8	0.3	97.3
North Carolina	21,003	3.1	1.8	0.9	1.7	0.5	95.0
Ohio	7,214	0.8	1.2	0.7	4.4	0.6	96.8
Oregon	10,676	2.1	1.6	2.4	*	0.5	95.1
Rhode Island	277	1.8	1.4	2.2	10.0	1.8	94.2
Tennessee	15,186	0.9	1.0	0.8	100.0	0.4	97.5
Vermont	4,755	1.8	1.4	1.2	3.4	0.0	97.0
Washington	1,550	1.8	1.2	1.1	*	0.5	96.8
Wisconsin	81	*	*	*	*	*	*
TOTAL PERCENT		1.7	1.4	1.1	0.8	0.6	96.5
Number of Measurements	336,276	333,754	332,806	336,276	54,927	153,820	324,365

[1]Since a record may have more than one error and the denominators used are counts of records with known values for each measurement, the sum of a line may not equal 100%.

Table 6. Prevalence of probable measurement, recording, and/or keying errors in records for screened children through 9 years of age in selected States – 1982[1]
CDC Pediatric Nutrition Surveillance System

State	Number	Percent With Probable Error[2]										Percent Without Probable Error
		Low					High					
		Ht	Wt	Age	Hgb	Hct	Ht	Wt	Age	Hgb	Hct	
Arizona	19,203	1.5	0.7	0.3	0.4	1.3	0.1	0.7	1.0	1.0	0.3	95.9
Arkansas	947	0.6	0.2	0.3	0.6	5.4	0.2	0.6	0.5	–	0.8	96.2
California	1,994	0.4	0.4	0.4	...	1.0	0.1	0.8	1.1	...	0.2	96.9
Colorado	13,050	1.4	0.7	0.2	*	2.6	0.0	0.2	1.2	8.1	0.5	95.6
Connecticut	2,547	1.5	1.3	0.2	0.7	1.8	0.1	0.7	1.2	0.1	1.2	95.5
Florida	49,874	1.3	1.1	0.6	1.7	3.7	0.3	0.7	1.2	0.1	0.3	94.1
Indiana	32,576	1.3	0.6	0.3	1.2	4.2	0.1	0.7	1.1	0.2	0.4	95.5
Iowa	17,765	0.8	0.3	0.5	0.7	1.2	0.1	0.7	0.5	0.4	0.2	96.7
Kentucky	27,687	1.6	0.7	0.3	1.9	2.2	0.2	0.6	1.0	0.4	0.2	95.3
Louisiana	9,500	0.6	0.3	0.5	1.1	0.8	0.3	1.1	0.7	0.6	0.2	95.9
Michigan	69,034	0.3	0.1	0.3	0.2	0.7	0.2	1.2	0.5	0.3	0.6	96.4
Minnesota	2,877	0.1	0.0	0.3	0.8	0.5	0.1	0.9	0.4	8.5	0.5	97.6
Missouri	33	*	*	*	*	*	*	*	*	*	*	*
Montana	4,446	0.5	0.3	0.2	*	1.7	0.0	0.6	0.8	*	0.1	97.0
Nebraska	6,951	1.8	1.3	0.2	*	2.3	0.1	0.8	1.3	*	0.3	94.7
Nevada	7,537	1.4	0.5	0.2	0.3	1.0	0.1	0.6	1.2	4.3	0.2	95.8
North Carolina	19,952	1.2	0.8	0.4	0.8	1.6	0.3	0.6	0.7	0.2	0.5	95.6
Ohio	6,985	0.3	0.2	0.3	0.6	0.6	0.1	1.0	0.4	0.6	0.7	97.1
Oregon	10,154	0.7	0.5	0.4	2.6	1.3	0.1	0.4	1.6	*	0.2	96.1
Rhode Island	261	0.4	0.8	0.4	*	1.9	–	0.4	0.8	4.7	–	96.2
Tennessee	14,799	0.6	0.2	0.3	...	1.5	0.0	0.8	0.8	...	0.3	96.1
Vermont	4,614	0.5	0.6	1.0	*	0.4	0.2	0.7	0.7	3.6	0.2	97.1
Washington	1,500	0.4	0.2	0.3	*	0.5	0.1	0.6	0.5	*	0.4	97.4
Wisconsin	7	*	*	*	*	*	*	*	*	*	*	*
TOTAL PERCENT		1.0	0.6	0.4	1.2	1.5	0.2	0.8	0.9	0.4	0.4	95.7
Number of Measurements	324,365	322,071	321,169	324,365	53,343	149,745	322,071	321,169	324,365	53,343	149,745	310,452

[1]After exclusion of highly probable errors
[2]Since a record may have more than one error and the denominators used are counts of records with known values for each measurement, the sum of a line may not equal 100%.

programs whose clients are self selected in terms of their decision to apply to a specific program. Also, entrance into a program depends on meeting eligibility requirements that often include income criteria. Thus, these data can be taken to represent rates of nutritional problems only among the self-selected, relatively low-income populations under surveillance. The relationship of the nutritional status of this population to the status of the community at large or that of high-risk individuals who, for whatever reason, are not served by these programs, is unknown and may vary from State to State. An additional concern is that trends in surveillance data can be influenced by changes in program eligibility criteria or by factors that influence eligible persons to apply to a specific program.

Despite these limitations, the surveillance data do provide an ongoing means of assessing the prevalence of nutritional problems among populations utilizing publicly supported health programs. These data can be obtained inexpensively and are routinely available and can be useful for identifying problems and detecting changes of public health significance in these population groups at increased nutritional risk.

PEDIATRIC SURVEILLANCE RESULTS

Anthropometry

In order to evaluate current status and trends, the data on height, weight, age, and sex of children are converted to percentiles of the NCHS reference population data base. Measurements less than the 5th percentile of the reference population for height-for-age or weight-for-height and those greater than the 95th percentile of the reference for weight-for-height are reported as potentially abnormal values. Although cutoff points for abnormal values can be adjusted to meet specific local requirements, standard criteria are essential for making meaningful national comparisons among populations.

Among children 3 months through 5 years old, the percentage of children whose height-for-age (or length-for-age) was below the 5th percentile was greater than the expected 5% (Table 7). This percentage was greatest among black children less than 6 months of age and among Asian children in all other age groups. Among children over 6 months of age, Asian children had the greatest percentage of low height-for-age, and among children over 11 months of age, Hispanic and Native American children had the next greatest prevalence of short stature within each age group.

Different ethnic groups showed different trends in the prevalence of short stature with age (Table 7). For blacks, low height-for-age was most prevalent in infancy and became less prevalent with age. For whites, the prevalence of short stature remained relatively steady through 5 years of age and then declined. Among Hispanic children the prevalence of short stature remained relatively high from infancy through 9 years of age. For Native American children the prevalence of short stature appeared similar to that of Hispanic children through 2 years of age with a gradual decline thereafter. The number of children categorized as Native American was far smaller than the number of children included in any other ethnic group except for Asians; thus these data should be interpreted cautiously.

Table 7. Prevalence of abnormal anthropometric indices among screened children through 9 years of age in selected States – 1982
CDC Pediatric Nutrition Surveillance System

Age Group & Ethnic Origin[1]	No. Exam.	Height-for-Age % Below 5th Percentile	Weight-for-Height % Below 5th Percentile	Weight-for-Height % Above 95th Percentile
< 3 Months				
White	43,450	4.1	4.6	4.0
Black	18,663	5.8	7.4	5.5
Hispanic	8,165	3.9	5.2	3.8
Nat. Amer.	1,460	4.0	3.4	3.8
Asian	778	4.5	4.1	4.2
3-5 Months				
White	14,285	10.9	2.1	10.0
Black	5,536	14.7	2.1	14.5
Hispanic	2,012	11.1	2.4	11.3
Nat. Amer.	381	11.5	3.1	12.1
Asian	230	7.8	2.2	9.6
6-11 Months				
White	21,787	9.6	3.4	7.5
Black	10,946	11.7	3.2	9.8
Hispanic	3,132	11.3	3.2	9.6
Nat. Amer.	487	11.7	2.5	10.9
Asian	385	22.9	3.9	6.5
12-23 Months				
White	27,519	10.7	3.7	9.1
Black	13,086	10.8	4.6	10.9
Hispanic	3,610	12.4	4.0	11.7
Nat. Amer.	536	12.5	4.9	14.2
Asian	526	26.8	10.8	3.4
2-5 Years				
White	64,677	9.0	1.9	5.2
Black	28,821	6.1	2.9	6.0
Hispanic	7,178	12.0	2.3	8.6
Nat. Amer.	1,109	10.3	1.4	10.4
Asian	879	31.7	7.1	3.1
6-9 Years				
White	11,221	6.7	1.5	8.5
Black	9,196	3.4	3.2	6.2
Hispanic	625	12.2	1.8	12.3
Nat. Amer.	114	8.8	–	4.4
Asian	78	*	*	*

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees

Weight-for-height is the anthropometric index that is used to assess relative thinness or obesity. The prevalence of low weight-for-height (below the 5th percentile) was consistently at or below the 5% level for all age and ethnic groups except 1- through 5-year-old Asian children and black infants less than 3 months old. These data suggest that thinness, as a reflection of undernutrition, is not a major public health problem among children reported in CDC's Pediatric Nutrition Surveillance System. However, overweight children (weight-for-height greater than the 95th percentile) generally constitute more than the expected 5% of the population (Table 7). Among children 6 months to 5 years old, overweight was most prevalent among Native Americans. Black children 3 to 5 months old and Hispanic children 1 year of age and older also displayed a relatively high prevalence of overweight.

Table 8 shows the prevalence of these anthropometric indices among different ethnic groups for 1978-82 by year. Except for a sharp increase in the prevalence of low height-for-age among Asian children during 1978-80, the prevalences of low or high anthropometric indices for all ethnic groups are not suggestive of any marked trends over time. A closer examination of the data by age group affords some additional insight, however. Tables 9 and 10 present the data for children less than 2 years of age and 2-5 years of age, respectively. Among children less than 2 years of age, there is a modest decrease in the prevalence of low height-for-age and high weight-for-height. There are no consistent trends in the 2-5 year age group.

An influx of Southeast Asian refugee children to the United States began in the late 1970's, and increasing numbers were treated at clinics submitting data to the Nutrition Status Surveillance System. The high prevalence of short stature among Asian children (Table 8) is related to the inclusion of these recently arrived refugee children.

Hematology

Data on hemoglobin and/or hematocrit were reported in 1982 from most of the States participating in the Pediatric Nutrition Surveillance System. Approximately 26% of the hematology data reported were hemoglobin values, while 74% were hematocrits.

After the first 6 months of a child's life, normal hemoglobin and hematocrit values rise slowly but steadily with age. Most clinics providing data to the Nutritional Status Surveillance System have adjusted their screening levels to reflect these developmental increases in hemoglobin or hematocrit by stepwise increases in the cutoffs used to define normal values. At present, these arbitrary cutoff values are $\leq$10.0 gm/dl for children 6 through 23 months old, $\leq$11.0 gm/dl for 2- through 5-year-olds, and $\leq$12.0 gm/dl for 6- through 9-year-olds.

This step system has obvious disadvantages for assessment of individuals near the step ages. For example, a 23-month-old whose hemoglobin is 10.2 gm/dl would be considered normal; 1 month later this same child would be considered anemic even if his or her hemoglobin had risen to 10.9. To remove such factors as artifactual causes of anemia and to define more precisely the continuous

Table 8. Prevalence of abnormal anthropometric indices among screened children through 9 years of age in selected States, 1978-82
CDC Pediatric Nutrition Surveillance System

Ethnic Origin	Abnormal Index	Year					5-Year Total
		1978	1979	1980	1981	1982	
White	No.	112,253	131,282	180,063	150,265	182,939	756,802
	Low Ht-Age	8.9	8.7	8.4	8.5	8.2	8.5
	Low Wt-Ht	2.7	2.5	2.8	2.7	3.0	2.8
	High Wt-Ht	7.7	7.4	7.1	6.5	6.3	6.9
Black	No.	46,292	50,423	74,971	66,784	86,248	324,718
	Low Ht-Age	8.0	7.4	7.3	7.6	7.7	7.6
	Low Wt-Ht	3.2	3.1	3.2	3.5	4.1	3.5
	High Wt-Ht	7.6	8.0	7.9	7.6	7.7	7.7
Hispanic	No.	11,427	13,095	21,653	16,750	24,722	87,647
	Low Ht-Age	9.8	10.2	9.5	9.1	9.2	9.5
	Low Wt-Ht	2.7	3.3	3.6	3.4	3.6	3.4
	High Wt-Ht	8.9	8.7	8.6	7.5	7.9	8.3
Native American[1]	No.	6,958	6,789	9,601	3,938	4,087	31,373
	Low Ht-Age	8.9	7.8	8.2	7.5	8.6	8.2
	Low Wt-Ht	4.1	3.3	3.4	3.3	2.8	3.4
	High Wt-Ht	10.8	10.4	10.8	10.1	8.6	10.3
Asian[2]	No.	693	1,468	4,644	2,770	2,876	12,451
	Low Ht-Age	22.5	28.5	31.7	22.8	20.6	26.3
	Low Wt-Ht	4.6	4.4	4.8	4.5	6.1	5.0
	High Wt-Ht	4.5	5.5	4.2	5.2	4.4	4.7

[1]American Indian or Alaskan Native
[2]Includes Southeast Asian refugees

Table 9. Prevalence of abnormal anthropometric indices among screened children less than 2 years of age in selected States, 1978-82
CDC Pediatric Nutrition Surveillance System

Ethnic Origin	Abnormal Index	Year					5-Year Total
		1978	1979	1980	1981	1982	
White	No.	54,215	62,321	89,643	81,515	107,041	394,735
	Low Ht-Age	9.3	9.2	8.5	8.4	7.8	8.5
	Low Wt-Ht	3.5	3.4	3.7	3.5	3.8	3.6
	High Wt-Ht	9.1	8.7	8.0	7.1	6.8	7.8
Black	No.	18,740	20,573	32,559	33,090	48,231	153,193
	Low Ht-Age	11.8	11.1	10.4	10.0	9.5	10.3
	Low Wt-Ht	3.9	3.4	3.6	4.1	5.1	4.2
	High Wt-Ht	10.8	11.2	10.7	9.4	9.0	9.9
Hispanic	No.	6,839	7,989	12,624	11,704	16,919	56,075
	Low Ht-Age	8.7	8.7	7.8	7.6	7.9	8.0
	Low Wt-Ht	3.5	4.2	4.8	4.1	4.2	4.2
	High Wt-Ht	8.9	8.8	8.3	7.0	7.5	7.9
Native American[1]	No.	5,248	4,669	6,699	2,686	2,864	22,166
	Low Ht-Age	8.3	7.5	7.7	7.5	7.9	7.8
	Low Wt-Ht	4.7	4.0	4.1	4.1	3.5	4.2
	High Wt-Ht	10.3	10.1	10.4	9.9	8.0	9.9
Asian[2]	No.	381	707	1,722	1,772	1,919	6,501
	Low Ht-Age	13.1	19.0	20.3	16.9	14.7	17.2
	Low Wt-Ht	4.7	5.9	6.3	4.5	5.7	5.5
	High Wt-Ht	6.6	8.6	7.0	5.8	5.1	6.3

[1]American Indian or Alaskan Native
[2]Includes Southeast Asian refugees

Table 10. Prevalence of abnormal anthropometric indices among screened children 2 to 5 years of age in selected States, 1978-82
CDC Pediatric Nutrition Surveillance System

Ethnic Origin	Abnormal Index	Year					5-Year Total
		1978	1979	1980	1981	1982	
White	No.	36,243	44,805	61,156	49,934	59,716	251,854
	Low Ht-Age	9.2	8.7	8.9	9.3	9.1	9.0
	Low Wt-Ht	1.9	1.8	2.0	1.9	2.0	1.9
	High Wt-Ht	5.4	5.2	5.2	4.9	5.0	5.1
Black	No.	14,203	15,859	25,208	21,422	25,896	102,588
	Low Ht-Age	6.7	5.8	5.9	6.3	6.3	6.2
	Low Wt-Ht	2.6	2.9	3.0	2.9	2.9	2.9
	High Wt-Ht	4.9	5.1	5.2	5.7	6.0	5.4
Hispanic	No.	3,060	4,000	6,861	4,117	6,785	24,823
	Low Ht-Age	11.2	12.3	12.2	12.7	11.9	12.1
	Low Wt-Ht	1.4	1.9	2.0	1.8	2.2	2.0
	High Wt-Ht	7.6	7.6	8.1	7.9	8.4	8.0
Native American[1]	No.	1,567	1,771	2,587	1,087	1,043	8,055
	Low Ht-Age	11.7	9.4	10.1	8.1	10.6	10.1
	Low Wt-Ht	2.0	1.9	1.8	1.7	1.2	1.8
	High Wt-Ht	12.3	10.8	11.8	11.2	10.5	11.4
Asian[2]	No.	269	623	1,719	834	837	4,282
	Low Ht-Age	35.7	36.9	36.5	33.1	31.4	34.8
	Low Wt-Ht	4.8	2.9	3.6	4.8	7.4	4.6
	High Wt-Ht	1.9	2.4	2.9	4.0	3.2	3.0

[1]American Indian or Alaskan Native
[2]Includes Southeast Asian refugees

nature of developmental increases in red-blood-cell volume, mean and standard deviation curves were developed from NHANES I data and used to compute age-specific percentiles and standard deviation scores for hemoglobin and hematocrit levels in children from 6 months to 10 years old. The development of these curves and the use of the 5th percentile as a cutoff point are discussed in more detail in the appendix of the 1980 nutrition surveillance report (2). In accord with the findings and recommendations of Reeves et al. (5), the CDC surveillance system currently uses and recommends similar anemia screening criteria for black and white children.

Table 11 presents prevalences of low hemoglobin levels (as defined by several possible cutoffs) by ethnic origin and age. Anemia prevalence results using the stepwise cutoffs employed by most clinics are highlighted in the tables. Among most ethnic groups low hemoglobin is least prevalent among children in the 6- through 23-month-old age group. The prevalence of anemia is consistently lower when using the 5th percentile cutoff than when using the stepped cutoffs or the single 11.0gm/dl cutoff proposed by the World Health Organization for children 6 months through 5 years old (4). By any criteria, the prevalence of low hemoglobin is greatest among black children.

When several possible cutoffs are used, the pattern of results for hematocrit data (Table 12) is similar to that for hemoglobin. The prevalence of abnormal values is greatest among 6- to 9-year-olds when the stepped cutoffs are used, but not when the 5th percentile is used to define anemia.

Prevalences of low hemoglobin and hematocrit values were analyzed by year for the period 1978-1982 (Table 13). The cutoffs used were the 5th percentile of the reference population. Overall downward trends in the prevalence of anemia when measured by hemoglobin were apparent among blacks and whites. The downward trend in anemia prevalence was generally observed among both younger (<23 months old) and older (≥2 years old) black and white children (Tables 14 and 15). Among Hispanics and Native American children, the trends were less consistent. Anemia assessed by hematocrits also showed an overall downward trend through 1981, although an increase was noted in white, black, and Hispanic ethnic groups in 1982.

MULTIPLE ABNORMALITIES

The frequency of the occurrence of multiple abnormalities in the same child was tabulated by age and ethnic group (Table 16). The frequency of multiple abnormalities was not associated with age or with any particular ethnic group, except for Asian children among whom multiple abnormalities were more frequent.

PREGNANCY NUTRITION SURVEILLANCE

Background

Pregnancy nutrition surveillance was developed to provide data useful for assessing community needs for maternal nutrition services. In consultation with State public health nutrition directors, risk indices determined to be useful for monitoring the course of pregnancy in terms of nutritional needs

Table 11. Prevalence of hemoglobin values below selected thresholds among screened children through 9 years of age in selected States — 1982
CDC Pediatric Nutrition Surveillance System

Age Group & Ethnic Origin[1]	Number Examined	% Less Than Indicated Hemoglobin Level(gm/dl)[2] 10.0	11.0	12.0	% Below 5th Percentile
6-11 Months					
White	4,839	5.4	25.7	61.5	2.4
Black	3,104	6.8	30.4	68.0	2.8
Hispanic	1,323	4.5	22.8	56.9	1.7
Nat. Amer.	87	*	*	*	*
Asian	83	*	*	*	*
12-23 Months					
White	8,154	5.8	22.9	56.5	4.3
Black	4,763	7.6	32.0	68.5	5.6
Hispanic	1,478	5.8	23.3	56.6	4.9
Nat. Amer.	98	*	*	*	*
Asian	152	10.5	26.3	59.9	6.6
2-5 Years					
White	16,014	1.5	12.6	38.6	6.1
Black	8,213	3.2	22.5	55.9	12.4
Hispanic	2,816	1.7	10.3	35.2	5.9
Nat. Amer.	218	-	4.1	19.3	2.3
Asian	228	2.2	13.2	29.8	6.6
6-9 Years					
White	901	-	1.1	8.2	5.2
Black	1,188	-	2.3	20.4	11.0
Hispanic	304	-	-	2.0	0.3
Nat. Amer.	13	*	*	*	*
Asian	56	*	*	*	*

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees
[2]Current standards highlighted

Table 12. Prevalence of hematocrit values below selected thresholds among screened children through 9 years of age in selected States -- 1982
CDC Pediatric Nutrition Surveillance System

Age Group & Ethnic Origin[1]	Number Examined	% Less Than Indicated Hematocrit Level (%)[2] 31	34	37	% Below 5th Percentile
6-11 Months					
White	13,190	6.4	32.3	74.5	7.0
Black	6,965	6.0	31.8	73.4	6.6
Hispanic	1,617	8.8	36.1	75.8	10.5
Nat. Amer.	264	3.0	25.8	67.0	3.8
Asian	252	9.5	29.0	68.7	9.5
12-23 Months					
White	19,208	4.1	23.8	64.4	6.3
Black	9,577	5.7	27.9	67.3	7.6
Hispanic	2,459	6.0	27.2	68.3	8.6
Nat. Amer.	390	4.1	20.0	61.0	7.4
Asian	382	6.3	20.9	55.0	9.2
2-5 Years					
White	45,938	1.7	14.6	53.2	7.1
Black	22,265	2.5	18.6	57.3	10.0
Hispanic	4,716	3.2	20.3	55.3	11.6
Nat. Amer.	823	1.3	10.8	45.0	4.7
Asian	617	1.6	10.5	40.5	5.5
6-9 Years					
White	11,080	-	1.9	21.2	4.0
Black	9,236	-	3.6	30.3	7.7
Hispanic	480	-	1.5	15.4	2.9
Nat. Amer.	113	-	0.9	18.6	4.4
Asian	27	*	*	*	*

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugee
[2]Current standards highlighted

Table 13. Prevalence of low hemoglobin and hematocrit values[1] among screened children 6 months through 9 years of age in selected States, 1978-82

Ethnic Origin	Hematology	1978 No. Exam.	1978 % Low	1979 No. Exam.	1979 % Low	1980 No. Exam.	1980 % Low	1981 No. Exam.	1981 % Low	1982 No. Exam.	1982 % Low	5-Year Total No. Exam.	5-Year Total % Low
White	Hemoglobin	12,807	7.7	13,772	6.4	21,958	6.7	23,293	5.3	29,908	5.0	101,738	6.0
	Hematocrit	38,322	9.8	68,401	6.6	110,837	6.0	80,717	5.6	89,416	6.5	387,693	6.5
Black	Hemoglobin	6,166	11.1	6,138	10.5	11,100	9.8	11,125	9.7	17,268	8.7	51,797	9.7
	Hematocrit	9,873	10.9	24,342	7.4	50,784	7.0	41,405	7.1	48,043	8.6	174,447	7.7
Hispanic	Hemoglobin	2,370	3.8	1,934	4.1	4,677	4.6	3,295	3.3	5,921	4.4	18,197	4.1
	Hematocrit	4,890	11.7	5,942	12.6	9,494	8.2	5,737	9.4	9,272	10.1	35,335	10.1
Native American[2]	Hemoglobin	269	4.1	276	6.5	549	2.6	455	3.3	416	1.9	1,965	3.4
	Hematocrit	3,125	9.4	3,317	6.4	4,394	5.7	1,742	6.8	1,590	5.2	14,168	6.8
Asian[3]	Hemoglobin	112	8.9	332	7.2	1,205	5.2	591	5.6	519	6.2	2,759	5.9
	Hematocrit	381	5.8	721	5.4	2,250	4.5	1,114	8.0	1,278	7.4	5,744	6.0

[1]"Low" defined as less than 5th percentile of CDC reference curves based on NHANES I data (see Nutrition Surveillance 1980).
[2]American Indian or Alaskan Native
[3]Includes Southeast Asian refugees

Table 14. Prevalence of low hemoglobin and hematocrit values[1] among screened children 6-23 months of age in selected States, 1978-82 CDC Pediatric Nutrition Surveillance System

Ethnic Origin	Hematology	1978 No. Exam.	1978 % Low	1979 No. Exam.	1979 % Low	1980 No. Exam.	1980 % Low	1981 No. Exam.	1981 % Low	1982 No. Exam.	1982 % Low	5-Year Total No. Exam.	5-Year Total % Low
White	Hemoglobin	4,866	6.8	5,561	4.7	8,901	4.9	9,651	4.1	12,993	3.6	41,972	4.5
	Hematocrit	15,105	9.3	21,376	7.2	34,736	6.1	27,774	5.8	32,398	6.6	131,389	6.7
Black	Hemoglobin	2,237	6.2	2,261	5.0	4,066	5.2	3,914	5.8	7,867	4.5	20,345	5.1
	Hematocrit	3,443	9.2	6,432	6.4	13,534	6.1	12,700	6.0	16,542	7.2	52,651	6.6
Hispanic	Hemoglobin	1,222	3.9	879	3.8	1,750	3.9	1,409	3.1	2,801	3.4	8,061	3.6
	Hematocrit	2,317	12.6	2,284	14.3	3,319	8.9	2,551	9.1	4,076	9.3	14,547	10.5
Native American[2]	Hemoglobin	143	4.2	135	5.9	256	2.3	215	2.8	185	1.6	934	3.1
	Hematocrit	1,711	8.5	1,425	6.1	1,835	6.3	740	7.0	654	6.0	6,365	6.9
Asian[3]	Hemoglobin	44	*	115	9.6	293	7.5	215	6.5	235	6.0	902	7.2
	Hematocrit	150	7.3	275	5.5	631	6.7	562	10.0	634	9.3	2,252	8.1

[1] "Low" defined as less than 5th percentile of CDC reference curves based on NHANES I data (see Nutrition Surveillance 1980).
[2] American Indian or Alaskan Native
[3] Includes Southeast Asian refugees

Table 15. Prevalence of low hemoglobin and hematocrit values[1] among screened children 2 to 5 years of age in selected States, 1978-82, CDC Pediatric Nutrition Surveillance System

Ethnic Origin	Hematology	1978 No. Exam.	1978 % Low	1979 No. Exam.	1979 % Low	1980 No. Exam.	1980 % Low	1981 No. Exam.	1981 % Low	1982 No. Exam.	1982 % Low	5-Year Total No. Exam.	5-Year Total % Low
White	Hemoglobin	5,743	9.0	6,145	6.8	10,414	8.2	12,199	5.9	15,579	6.2	50,080	6.9
	Hematocrit	17,734	11.3	31,072	7.1	48,530	6.4	35,982	5.9	42,170	7.4	175,488	7.2
Black	Hemoglobin	2,370	11.4	2,561	10.2	5,070	10.4	5,613	10.3	7,883	12.6	23,497	11.2
	Hematocrit	4,447	12.2	9,656	7.9	20,765	7.2	16,750	7.7	19,745	10.5	71,363	8.6
Hispanic	Hemoglobin	791	5.1	859	4.4	2,167	5.9	1,591	3.9	2,666	6.2	8,074	5.4
	Hematocrit	2,060	12.4	3,015	12.6	4,643	8.7	2,536	10.6	4,560	11.9	16,814	11.0
Native American[2]	Hemoglobin	114	4.4	138	7.2	265	1.9	226	4.0	212	1.9	955	3.5
	Hematocrit	1,384	10.7	1,562	7.4	2,255	5.5	838	7.2	763	4.7	6,802	7.1
Asian[3]	Hemoglobin	62	*	172	4.7	483	3.5	283	4.6	208	6.3	1,208	4.6
	Hematocrit	188	3.2	352	5.7	1,002	3.4	494	6.1	600	5.7	2,636	4.7

[1]"Low" defined as less than 5th percentile of CDC reference curves based on NHANES I data (see Nutrition Surveillance 1980).
[2]American Indian or Alaskan Native
[3]Includes Southeast Asian refugees

Table 16. Prevalence of abnormalities[1] among screened children through 9 years of age in selected States – 1982
CDC Pediatric Nutrition Surveillance System

Ethnic Origin[2] & Age Group	Number of Children Examined	% With Indicated Number of Abnormalities			
		0	1	2	3
White					
6-11 Months	17,176	74.8	22.2	2.8	0.2
12-23 Months	26,053	72.0	25.2	2.7	0.1
2-5 Years	59,222	78.2	19.7	2.0	0.1
6-9 Years	10,788	81.5	17.2	1.3	0.0
TOTAL	113,239	76.6	21.1	2.2	0.1
Black					
6-11 Months	8,904	71.1	24.8	3.9	0.2
12-23 Months	12,465	68.7	27.3	3.9	0.1
2-5 Years	27,332	75.6	22.0	2.3	0.1
6-9 Years	8,666	80.7	17.8	1.4	0.1
TOTAL	57,367	74.2	23.0	2.7	0.1
Hispanic					
6-11 Months	2,586	71.5	24.4	3.8	0.3
12-23 Months	3,442	66.9	29.0	3.8	0.3
2-5 Years	6,577	69.9	26.7	3.2	0.2
6-9 Years	537	75.4	22.3	2.2	–
TOTAL	13,142	69.7	26.7	3.4	0.2
Native American					
6-11 Months	336	72.6	25.9	1.2	0.3
12-23 Months	459	65.6	29.8	4.1	0.4
2-5 Years	988	76.9	21.0	2.1	–
6-9 Years	108	83.3	15.7	0.9	–
TOTAL	1,891	73.8	23.7	2.4	0.2
Asian					
6-11 Months	317	61.2	34.1	4.4	0.3
12-23 Months	487	56.5	34.9	7.8	0.8
2-5 Years	791	54.4	38.1	6.7	0.9
6-9 Years	69	*	*	*	*
TOTAL	1,664	55.9	36.8	6.6	0.7

[1]Abnormalities included were:
a. Height for age < 5th percentile
b. Weight for height < 5th percentile or > 95th percentile
c. Hemoglobin and/or hematocrit < 5th percentile

[2]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees

were identified. These indices include maternal factors such as height, weight, and hematocrit or hemoglobin, along with blood pressure and urinary protein/glucose when these data were available. Maternal behavioral factors such as smoking cigarettes, taking vitamin or mineral supplements, participating in programs such as the food stamp program or WIC, and breast-feeding practice at the first postpartum visit were recorded. Pregnancy outcome information included gestational age, the status of the infant at birth (whether live born or not) and birth weight. The only records accepted for pregnancy surveillance tabulations were those specifying pregnancy outcome data, including birth weight.

During 1982, about 19,825 records from 14 States and the District of Columbia (Figure 2) were submitted to the Pregnancy Nutrition Surveillance System. These data came primarily from MCH, WIC, and other health programs providing prenatal care.

Risk Factors in Pregnancy

The prevalence of selected individual risk factors among prenatal patients delivering during 1982 and included in the CDC Pregnancy Nutrition Surveillance System is shown in Table 17. Of the women screened, more white women of all age groups smoked cigarettes (41.4%) than did women in other groups; 26.3% of all black women smoked. Very few women had high blood pressure. Low hematocrit levels were evident in 24.3% of all the women, while 13.8% had low hemoglobin levels. Black women had by far the highest prevalence of low hematocrit (35.4%) and hemoglobin (23.1%) levels.

Breast Feeding

Followup data were obtained at the first postpartum visit (6-10 weeks) for 6,897 women (Table 18); 37.8% were breast feeding. Mothers older than 20 years of age were more likely to breast feed than younger mothers. White (47.7%) and Native American mothers (52.4%) were the most likely to breast feed, while black mothers were the least likely to breast feed. Among teenage mothers, only 12.1% of blacks were breast feeding at 6-10 weeks. This percentage was down from 15.9% in 1981. Breast-feeding data were available on only 31% of women in the surveillance system, so these data may not be truly representative of breast-feeding patterns among women utilizing publicly supported health services.

Birth Weight

Information on the birth weight of infants serves as the principal indicator of pregnancy outcome. As summarized in Table 19, the overall prevalence of low birth weight (less than 2,500 grams) in this population was 7.1%. Low birth weight was more prevalent among infants born to women less than 20 years of age than among infants born to older women; low birth weight was also more prevalent among black infants than among infants in any other ethnic group. Low birth weight was least prevalent among Native American infants. Mothers who smoked were almost twice as likely to deliver low-birth-weight babies as those who did not smoke. This figure varied little by age or by ethnic group.

Figure 2. State participation in pregnancy nutrition surveillance — 1982
CDC Pregnancy Nutrition Surveillance System

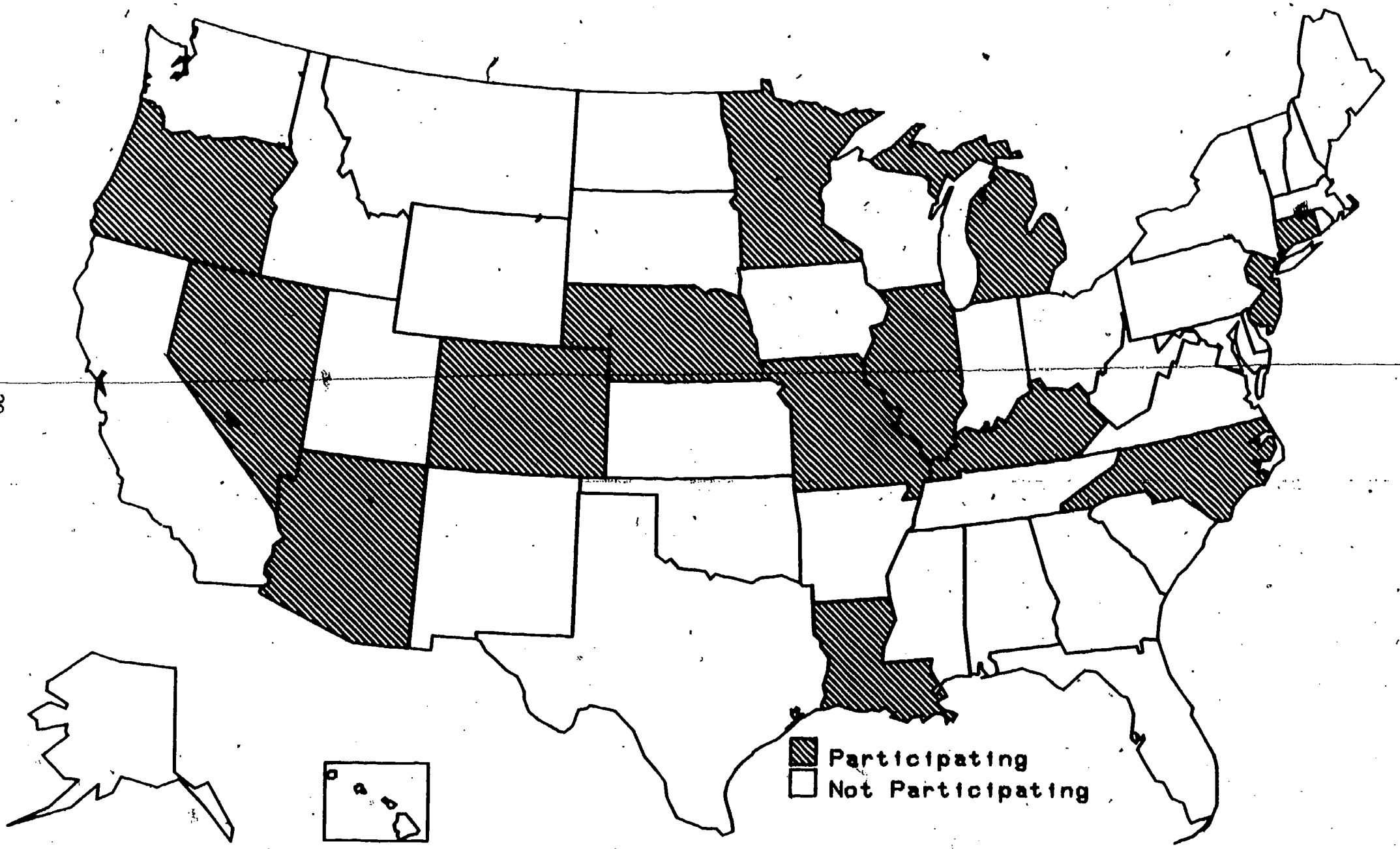


Table 17. Prevalence of reported selected risk factors among pregnant women delivering in 1982 CDC Pregnancy Nutrition Surveillance System

Age Group & Ethnic Origin[1]	Number Examined	Smoking		Blood Pressure		Hematocrit		Hemoglobin	
		Number Responding	% Yes	Number Responding	% High	Number Responding	% Low	Number Responding	% Low
< 20 Years									
White	2,550	2,202	45.2	994	0.2	1,729	18.3	1,019	8.9
Black	2,571	1,962	21.6	661	0.2	1,863	39.0	1,097	25.6
Hispanic	1,363	1,338	14.6	804	-	1,005	23.8	588	15.0
Nat. Amer.	317	312	10.9	258	0.4	224	19.2	108	0.9
Asian	82	81	*	38	*	50	*	36	*
Total	6,883	5,895	28.1	2,755	0.2	4,871	27.5	2,848	16.5
20+ Years									
White	4,993	4,561	39.6	1,839	0.8	3,412	15.3	2,262	6.0
Black	4,171	3,410	28.9	1,044	0.6	3,083	33.3	2,020	21.8
Hispanic	2,707	2,648	17.1	1,312	0.5	2,052	20.2	1,382	10.0
Nat. Amer.	772	757	11.0	600	0.5	595	18.2	254	10.2
Asian	299	290	5.2	100	-	156	21.8	184	15.8
Total	12,942	11,666	28.7	4,895	0.6	9,298	22.7	6,102	12.6
All Ages									
White	7,543	6,763	41.4	2,833	0.6	5,141	16.3	3,281	6.9
Black	6,742	5,372	26.3	1,705	0.4	4,946	35.4	3,117	23.1
Hispanic	4,070	3,986	16.3	2,116	0.3	3,057	21.4	1,970	11.5
Nat. Amer.	1,089	1,069	10.9	858	0.5	819	18.4	362	7.5
Asian	381	371	5.7	138	0.7	206	24.3	220	17.3
Total	19,825	17,561	28.5	7,650	0.5	14,169	24.3	8,950	13.8

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees

Table 18. Number and percent of breastfed infants 6 to 10 weeks of age by age group and ethnic origin of mother — 1982
CDC Pregnancy Nutrition Surveillance System

Age Group & Ethnic Origin[1]	Number Reported[2]	Responding[3] Number	Responding[3] %	% Breast Feeding
< 20 Years				
White	859	656	76.4	31.6
Black	576	340	59.0	12.1
Hispanic	619	506	81.7	21.1
Nat. Amer.	185	182	98.4	47.3
Asian	22	21	*	*
20+ Years				
White	1,910	1,375	72.0	55.3
Black	967	554	57.3	29.8
Hispanic	1,238	896	72.4	32.6
Nat. Amer.	422	412	97.6	54.6
Asian	99	77	*	*
All Ages				
White	2,769	2,031	73.3	47.7
Black	1,543	894	57.9	23.0
Hispanic	1,857	1,402	75.5	28.5
Nat. Amer.	607	594	97.9	52.4
Asian	121	98	81.0	*
Total	6,897	5,019	72.8	37.8

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees
[2]Number of women reported in pregnancy nutrition surveillance
[3]Number and percent of women responding to breast feeding question in pregnancy nutrition surveillance

Table 19. Prevalence of low birth weight (<2501 gms) by indicated maternal risk factor by age and ethnic origin of mother — 1982 CDC Pregnancy Nutrition Surveillance System

Age Group & Ethnic Origin[1]	All Women Examined		Without Indicated Risk Factors		Smoking: Yes		Smoking: No		High Blood Pressure: Yes		High Blood Pressure: No		Low Hematocrit: Yes		Low Hematocrit: No		Low Hemoglobin: Yes		Low Hemoglobin: No	
	No.	% LBW[2]	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW	No.	% LBW
< 20 Years																				
White	2,550	6.5	1,341	5.1	995	8.3	1,207	4.6	2	*	992	6.3	316	6.3	1,413	7.1	91	*	928	5.9
Black	2,571	10.2	1,462	9.3	424	14.6	1,538	8.3	1	*	660	10.3	726	9.5	1,137	9.7	281	16.7	816	10.0
Hispanic	1,363	6.7	924	6.8	196	9.7	1,142	6.2	...	...	804	7.3	239	4.6	766	7.4	88	*	500	8.0
Nat. Amer.	317	4.1	245	4.9	34	*	278	4.3	1	*	257	3.9	43	*	181	5.0	1	*	107	2.8
Asian	82	*	52	*	6	*	75	*	1	*	37	*	16	*	34	*	9	*	27	*
Total	6,883	7.8	4,024	7.1	1,655	10.0	4,240	6.4	5	*	2,750	7.4	1,340	7.5	3,531	7.9	470	9.1	2,378	7.7
20+ Years																				
White	4,993	5.3	2,805	3.7	1,808	7.9	2,753	3.6	15	*	1,824	6.1	523	5.0	2,889	5.4	135	3.0	2,127	5.1
Black	4,171	9.8	2,300	8.1	987	15.4	2,423	7.4	6	*	1,038	10.8	1,027	10.3	2,056	9.5	440	8.0	1,580	9.6
Hispanic	2,707	5.2	1,847	4.5	452	9.1	2,196	4.4	6	*	1,306	5.5	414	3.9	1,638	5.5	138	5.8	1,244	4.7
Nat. Amer.	772	4.5	586	3.4	83	*	674	4.0	3	*	597	4.4	108	8.3	487	3.9	26	*	228	3.1
Asian	299	6.7	230	5.7	15	*	275	6.2	...	...	100	5.0	34	*	122	5.7	29	*	155	8.4
Total	12,942	6.8	7,768	5.3	3,345	10.4	8,321	5.0	30	*	4,865	6.7	2,106	7.6	7,192	6.5	768	7.0	5,334	6.3
All Ages																				
White	7,543	5.7	4,146	4.2	2,803	8.1	3,960	3.9	17	*	2,816	6.1	839	5.5	4,302	6.0	226	4.0	3,055	5.3
Black	6,742	10.0	3,762	8.6	1,411	15.2	3,961	7.8	7	*	1,698	10.6	1,753	10.0	3,193	9.6	721	9.4	2,396	9.7
Hispanic	4,070	5.7	2,771	5.3	648	9.3	3,338	5.0	6	*	2,110	6.2	653	4.1	2,404	6.1	226	4.9	1,744	5.6
Nat. Amer.	1,089	4.4	831	3.9	117	7.7	952	4.1	4	*	854	4.2	151	6.0	668	4.2	27	*	355	3.0
Asian	381	7.3	282	6.4	21	*	350	6.9	1	*	137	6.6	50	*	156	7.1	38	*	182	8.2
Total	19,825	7.1	11,792	5.9	5,000	10.3	12,561	5.5	35	*	7,615	6.9	3,446	7.5	10,723	7.0	1,238	7.8	7,712	6.7

[1]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees
[2]Low birth weight

Regardless of age or smoking status, black mothers had a higher likelihood of delivering low-birth-weight babies than did women of other ethnic groups. Overall the prevalence of low birth weight was slightly higher for mothers with low hematocrit or hemoglobin levels than for mothers with normal levels.

The overall prevalence of low birth weight was 9.7% according to data collected through the CDC Pediatric Nutrition Surveillance System (Table 20), while the prevalence of low birth weight was 7.1% according to data from the pregnancy surveillance system. This difference may occur, in part, because some high-risk mothers do not enroll in MCH or WIC programs until after their low-birth-weight infants are born.

The prevalence of low birth weight among children in the Pediatric Nutrition Surveillance System was highest among black infants (12.8%) and lowest among Native American infants (6.1%). A cross tabulation of birth-weight status with various anthropometric indices demonstrates a strong association between low values for anthropometric indices and low birth weight (Table 21). Most of the catchup growth of low-birth-weight infants should occur by the end of the 2nd year of life. However, even the 2- to 4-year-old children with low-birth-weight histories were shorter and thinner than their normal-birth-weight counterparts while children in the high-birth-weight group (≥4,000 gms) were taller, heavier, and more at risk of overweight. Twenty-three percent of the low-birth-weight children still had low height-for-age at 3-4 years of age as compared with 10.3% of the normal-birth-weight children (2,501-3,999 gms) and 4.2% of those with high birth weights. Even late into the preschool years, overweight is less prevalent among children who were low birth-weight infants than among children who were not.

Table 20. Prevalence of low birth weight by ethnic origin for screened children less than 1 year of age in selected States – 1982[1]
CDC Pediatric Nutrition Surveillance System

Ethnic Origin[2]	No. Reported	% Low Birth Weight (< 2501 grams)
White	63,200	8.6
Black	29,622	12.8
Hispanic	13,026	8.3
Nat. Amer.	1,808	6.1
Asian	1,144	8.6
Total	108,800	9.7

[1]The births of these children occurred and were reported in 1982.
[2]Native American = American Indian or Alaskan Native
"Asian" includes Southeast Asian refugees

Table 21. Prevalence of abnormal anthropometric indices by birth weight and age of screened children through 4 years of age in selected States – 1982
CDC Pediatric Nutrition Surveillance System

Anthropometric Index & Age Group	Birth Weight (gms) < 2501 No. Exam.	< 2501 % < 5th	< 2501 % > 94th	2501-3999 No. Exam.	2501-3999 % < 5th	2501-3999 % > 94th	4000+ No. Exam.	4000+ % < 5th	4000+ % > 94th
Height-for-Age									
<3 Months	2,475	43.3	1.3	54,351	3.4	4.4	6,016	0.5	24.8
3-5 Months	1,984	50.8	0.3	15,918	8.0	2.5	1,666	2.9	11.7
6-11 Months	3,080	33.0	1.0	25,406	8.5	2.9	2,525	2.4	10.5
1 Year	3,202	26.7	1.4	26,715	10.0	3.2	2,572	3.6	7.5
2 Years	854	18.1	2.8	6,702	9.1	3.8	703	3.4	9.1
3-4 Years	716	23.0	1.5	5,675	10.3	3.4	650	4.2	6.6
TOTAL	12,311	34.7	1.2	134,767	6.8	3.6	14,132	2.0	15.9
Weight-for-Height									
<3 Months	2,475	15.1	3.7	54,351	4.8	4.0	6,016	1.0	8.2
3-5 Months	1,984	1.6	11.7	15,918	2.2	11.2	1,666	1.5	12.0
6-11 Months	3,080	4.3	7.8	25,406	3.2	8.2	2,525	2.7	10.8
1 Year	3,202	7.1	5.8	26,715	3.8	9.6	2,572	1.5	18.6
2 Years	854	8.2	5.2	6,702	2.6	5.8	703	0.6	10.8
3-4 Years	716	6.6	2.0	5,675	2.1	5.1	650	0.3	9.8
TOTAL	12,311	7.2	6.5	134,767	3.8	6.9	14,132	1.4	11.2
Weight-for-Age									
<3 Months	2,475	30.2	1.0	54,351	2.0	3.9	6,016	0.0	46.9
3-5 Months	1,984	24.6	0.4	15,918	3.2	6.4	1,666	1.5	22.7
6-11 Months	3,080	22.8	1.2	25,406	5.6	4.9	2,525	1.3	15.6
1 Year	3,202	19.2	2.2	26,715	7.0	6.1	2,572	1.7	16.4
2 Years	854	20.5	3.2	6,702	7.3	4.8	703	1.6	13.1
3-4 Years	716	19.3	1.3	5,675	6.7	3.8	650	1.2	11.4
TOTAL	12,311	23.3	1.4	134,767	4.3	4.9	14,132	0.9	29.6

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APPENDIX

Editing Procedure Used in CDC Pediatric Nutrition Surveillance

Errors in data submitted to the CDC-coordinated Pediatric Nutrition Surveillance System, particularly measurements taken of children in order to assess nutritional status; i.e., height (length or stature), weight, hemoglobin, and hematocrit, have been a concern since the beginning of the program. Such errors (which may result from faulty measuring equipment, improper measuring technique, erroneous recording or keying of measurements on records, or a combination of these) can lead to incorrect conclusions about the nutritional status of individuals as well as groups of children. Consequently, the development and application of edit criteria that can help identify errors in reported measurements have been essential. Once identified, these errors are corrected or eliminated from analysis.

Edit criteria for nutrition surveillance data have been developed for two levels: (1) identification of probable errors to be verified or corrected by reporting clinics, and (2) identification of highly probable errors so the data can be eliminated from analysis if they are not corrected by the reporting clinics. Both criteria use standard deviation (SD) scores computed from measurements of individual children; these measurements are calculated as standard deviations from the mean value of the reference population. For height-for-age, weight-for-age, and weight-for-height, the NCHS/CDC reference population is used. For hemoglobin- and hematocrit-for-age, mean and standard deviation values are derived from HANES I data.

A value for each indicator is calculated for each child describing the relative position of that child in relation to the reference population. The more an indicator value differs from the reference mean, the higher the probability that it resulted from an error. For example, a value that is more than 2.3 standard deviations below the reference mean has a chance of about 1 in 100 of being a real (accurate) measurement in the reference population, whereas a value more than 3.1 standard deviations below the reference mean has a chance of about 1 in 1,000 of being a real measurement. The probability of occurrence may be derived for any indicator using the normal probability density function.

In addition to having known associated probabilities of occurrence, each indicator has two components (e.g., height-for-age has both a "height" and an "age" component, and weight-for-height has both a "weight" and a "height" component). Therefore, if an indicator has an associated probability of occurrence that is less than the chosen cutoff for editing purposes, both of the components (measurements) may be erroneous.

Some components also may appear in more than one indicator providing additional information about them. For example, height is a component of both height-for-age and weight-for-height. Both indices provide information about height, and both should be used when editing for possible height errors. The following is a list of measurements and the indices of which they are components:

Measurement	Indicators
Height	(2) Height-for-Age, Weight-for-Height
Weight	(2) Weight-for-Age, Weight-for-Height
Hemoglobin	(1) Hemoglobin-for-Age
Hematocrit	(1) Hematocrit-for-Age
Age	(4) Height-for-Age, Weight-for-Age, Hemoglobin-for-Age, Hematocrit-for-Age

Note: Numbers in parentheses represent the number of indicators containing the listed measurement as a component. Errors in recording sex can also affect indicators, since references are sex-specific.

In addition to suggesting which measurement might be in error, the indicators also provide information about the direction of the error. For example, a negative height-for-age SD suggests that either the height measurement is low or the computed age is high.

Editing Procedure

A procedure based on combinations of indicators consisting of the same components has been developed for editing nutritional measurements used in pediatric nutrition surveillance. The criteria for identifying measurement errors are appropriate probability cutoffs for identifying probable and highly probable errors. The following probabilities (p), although arbitrary chosen, have been useful in classifying the probability of errors:

p = 0.01 (SD 2.3)	for identifying probable errors for verification and correction in clinics, and
p = 0.001 (SD 3.1)	for identifying highly probable errors for exclusion from analyses.

The associated SD cutoffs are shown graphically in Appendix Figure 1.

The smaller the probability that the indicator value is real, the larger the probability that the value resulted from an erroneous measurement. For example, if p = 0.01, the chances are 99 in 100 that the reported measurement is in error, assuming that the distribution of real values conforms to the reference population.

The procedure also involves using combinations of indicators having the same measurement as a component for editing that measurement. For example, both weight-for-age and weight-for-height would be used for editing weight, and all four indicators involving age (height-for-age, weight-for-age, hemoglobin-for-age, and hematocrit-for-age) would be used for editing age. In addition, the editing procedure requires that more than half the known indicators containing a given measurement must be a probable or highly probable error; i.e., they must have an associated probability of occurrence less than the appropriate cutoff.

The following example illustrates the procedure for identifying probable errors:

Indicator	S.D	p	Significance ($p < 0.01$)
Height-for-Age SD	-3.1	0.001	Significantly low
Weight-for-Age SD	0.2	0.421	Not significant
Weight-for-Height SD	2.6	0.005	Significantly high
Hemoglobin-for-Age SD	-	-	Unknown
Hematocrit-for-Age SD	-2.5	0.006	Significantly low

Measurement	Conclusion of Procedure
Height	Significantly low height-for-age SD and significantly high weight-for-height SD suggest that height measurement is low.
Weight	Both the weight-for-age SD and weight-for-height SD would have to be significant to suggest error. Since only high weight-for-height SD is significant, there is insufficient suggestion of error.
Hemoglobin	Unknown
Hematocrit	Significantly low hematocrit-for-age SD suggests that hematocrit value is low.
Age	Two of three known indices involving age (height-for-age and hematocrit-for-age) are significantly low. This suggests the age calculation is too high.

In this example, three measurements should be verified:

1. Height is too low, probably because of undermeasurement or an error made in recording height.

2. The hematocrit determination is too low; a laboratory or recording error was probably made.

3. Age is too high. An error was probably made in determining or recording the date of examination or date of birth.

APPENDIX FIGURE 1
Percent of Individuals from a Normally Distributed Population Having Values Below Standard Deviations Shown. 0.0 Represents Population Mean.